

# Market Practitioners Group Risk-Free Reference Rate Work Stream – August 2020

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## 1. Introduction

In response to the global reform of major IBOR-type rates, the South African Reserve Bank (SARB) released a paper, in August 2018, detailing its initial proposal to adopt these reforms for South African Interest Rate Benchmark Rates. In 2018, the SARB established a Market Practitioners Group (MPG), which is a joint public and private sector body, comprised of representatives of the SARB, the Financial Sector Conduct Authority (FSCA), and other senior professionals representing different market interest groups active in the domestic financial market. The MPG is chaired by SARB Deputy Governor: Markets and International.

The primary purpose of the MPG is to facilitate decisions on the choice of interest rates to be used as *reference rates* for financial contracts in South Africa, as well as to provide input to the SARB and the FSCA on the operationalisation of the interest rate benchmark proposals as contained in the Consultation Paper. The MPG duly established work streams to execute its mandate. The initial task of these work streams is to recommend to the MPG preferred choices of alternative reference rates, building on the recommendations made by the SARB.

## 2. Mandate of the Risk-Free Reference Rates Work Stream

The Risk-Free Reference Rates Work Stream was constituted by the Market Practitioners Group (MPG) in 2019, as part of several industry work streams established to inform the course of interest rate benchmark reform in South Africa. The work stream was mandated to review proposals and make final recommendations to the MPG on the choice and design of suitable risk-free interest rate benchmarks to be used as reference rates.

The Risk-Free Reference Rate Work Stream comprises members from various segments of the domestic financial market. The work stream's membership is detailed in [Appendix 1](#). The composition of the work stream is intended to ensure that the diversity of industry participants and perspectives is leveraged to inform the future trajectory of risk-free reference rates for South Africa.

## 3. Problem statement of the Risk-Free Rates Work Stream

The SARB's 2018 consultation paper on selected interest rate benchmarks in South Africa found that there are no risk-free money market interest rate benchmarks currently published in South African financial markets (KF.16 of the paper). The paper

also proposed a suite of risk-free rates (KR.4 to KR.10 of the paper) that could possibly serve as alternative risk-free reference rates.

With reference to the findings and recommendations from this paper, the rationale for transitioning to risk-free rates adopted globally and the mandate of this work stream, the Risk-Free Reference Rates Work Stream aims to solve for the following:

### **3.1. Problem statement**

Currently, South Africa has no suitable alternative risk-free reference rates that serve as a viable replacement for its key money market reference rate (JIBAR) which is used as the underlying interest for the majority of cash instruments and derivatives in the South African financial market.

Hence, in order to solve for this problem, the work stream aims to meet the following objectives:

- i. Define the guiding principles that will determine the selection criteria of the alternative risk-free reference rates.
- ii. Investigate possible risk-free reference rate candidates.
- iii. Provide the rationale for selecting the most suitable candidate rates.

This position paper outlines the recommendations of the Risk-Free Reference Rates Work Stream for consideration by the MPG. The position paper builds on the work stream meetings held during the course of 2019 and 2020, where the production of two alternative risk-free rates was recommended. The SARB has, in addition to the recommendations of the Risk-Free Reference Rates Work Stream, also provided its own views to the findings and recommendations of the Risk-Free Reference Rates Work Stream for consideration by the MPG.

## **4. Guiding principles**

### **4.1. IOSCO Principles for Financial Benchmarks**

The IOSCO principles for financial benchmarks has become a global standard for assessing the credibility of benchmark reform efforts across jurisdictions (more detail of these principles is found in [Appendix 2](#)). The Risk-Free Work Stream's position is that these principles should be the starting point to produce any robust reference rate. In this regard, IOSCO principles provides the criteria for producing a robust reference rate such as:

- Integrity; which relates to governance, reliability and accountability.
- Efficacy; which describes transparency provisions intended to support users to better understand the features of their reference rate of choice.

- Design provisions; these relate to data sufficiency where the intention is to ensure the reference rate reflects a credible market anchored in transactional volume.

#### 4.2. Additional principles for change

In addition to the IOSCO Principles, the Risk-Free Reference Rate Work Stream found that as a result of idiosyncrasies faced by each major currency area, an expanded set of criteria should also be adopted, namely:

- With regards to data sufficiency, authorities in these areas have recognised that they face heterogenic market conditions, differing availability of transactional data, varied markets for risk-free rates. Hence the adoption of a data waterfall and hierarchy is necessary.
- Reference rates must be resilient to general market stress and have a credible fallback in times of a market-wide dislocation.
- Market participants should be able to choose among a suite of rates that are fit for purpose.

#### 4.3. Implications

Globally, market participants have expressed a continued need for reference rates with banking sector credit risk premia. Traditionally banks prefer a reference rate that captures the banking sector funding costs so that they can use the loans they issue as a proxy hedge against that cost. The bank's funding costs are exposed to movements in the general level of interest rates and the bank's credit spreads. If bank loans are only linked to a risk-free rate, the issuing bank will only hedge the risk-free component of its funding cost. If bank credit spreads widen, then the bank is exposed to increasingly volatile earnings.

The international consensus is that a risk-free rate would make sense for derivatives transactions as market participants are using derivatives to hedge an exposure or speculate on the general level of market-wide interest rates. The desire for a risk-free rate reflects the continued increasing reliance on secured funding and structural changes in derivatives markets requiring greater use of collateral and shifts to central clearing.

These factors have led many markets to follow multi-rate approach, i.e.:

- Strengthening existing IBORs (IBOR+) with measures that support data sufficiency, e.g. introducing a hierarchy of data inputs and having a data waterfall. Other measures adopted include improving of pre and post-trade transparency. In a South-African context, an improved version of JIBAR which would continue to be based on banks' wholesale unsecured funding costs and

would be appropriate for hedging bank revenues of balance-sheet lenders. This matter is being dealt with in the Unsecured Reference Rates Work Stream.

- Developing a suite of alternative risk-free reference rates as financial transactions like derivatives are better suited to reference rates that are closer to risk-free.

The advantage of a multi-rate approach is that it provides visibility for the SARB with respect to critical systemic risk indicators from different channels within financial markets.

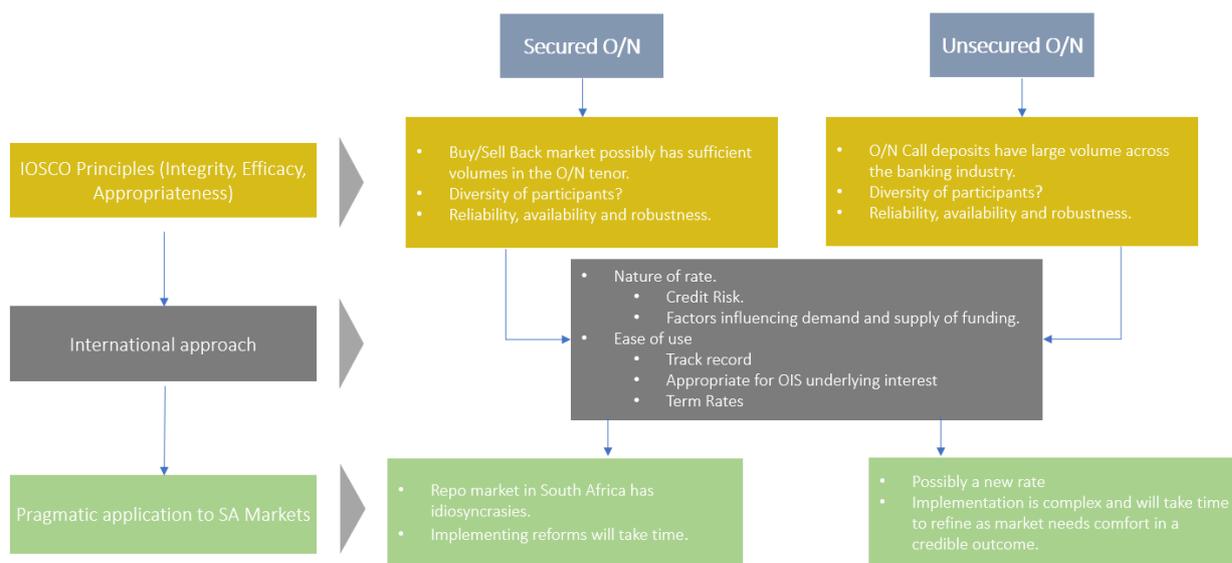
#### 4.4. Fit for purpose

The range of reference rates must offer more appropriate options to better fit the needs of various market participants. Major currency markets, such as the EU and Japan, who followed the unsecured O/N route also considered:

- The extent of credit risk reflected in the underlying transactions. For an overnight term or secured transactions, this risk is limited during non-stressed market conditions.
- The extent of the demand/supply dynamics of the underlying market that's reflected in the rate. Tactical pricing and regulatory preferences attached to a segment of counterparties will skew the rate.
- The suitability of the rate to address financial stability objectives such as monetary policy rate transmission and systemic monitoring. Linkages between the policy rate and other market rates must exist as ignoring this will introduce basis risk with respect to the underlying interest used in hedge rates, collateral rates and derivative rates. [Appendix 3](#) has more information with respect to the importance of creating this link.
- The rate must be appropriate to serve as the underlying interest in derivative transactions because of the volumes of derivative transactions that reset using the rate relative to cash instruments is substantial.

#### 4.5. Pragmatic application for South African Markets

All these factors must be applied considering the nuances within South African markets, including, as an example the limitations of the SA Government Bond repo market and its impact on a Secured O/N rate.



## 5. Identification of alternative risk-free rates for South Africa

The global approach to working towards developing risk-free rates recognizes that risk-free does not necessarily mean the credit risk of trading participants is zero, but as close to zero as possible, i.e. “near-risk-free”.

### 5.1. Criteria for near risk-free-rates

The criteria adopted for the South African “near-risk-free” rate centers around the following:

#### 5.1.1. Risk-free nature of the rate

- The rate must be desirable for derivative transactions used for hedging, risk-taking and arbitraging the general interest rate levels. They should reflect the reward for fixing the rate of cash for some term period rather than include bank credit risk.
- The transactions underlying a risk-free rate should, as far as possible, not reflect the credit risk of the parties of to the transaction.
- The rate will reflect the underlying supply and demand dynamics of its market on which it is based; for example, SOFR month/quarter and year-end spikes in rates due to liquidity needs.

#### 5.1.2. Depth of the market underlying the rate

- As per the IOSCO principles, the underlying market on which the rate is based must have sufficient volumes of transactions.

- The market should have a wide variety of participants to reduce the possibility of manipulating the rate.
- The assessment of the depth of the market must cover medium to long term.

### 5.1.3. “Fit-for-purpose”

- The risk-free rate identified should be easily used in financial transactions with derivatives as the primary concern for the use of a risk-free rate.
- This means that the work stream must consider the requirements for defining a new OIS market.
  - The availability of term reference rates is desirable in terms of expanding the use of the risk-free rate but, at least at the beginning of the introduction of risk-free rate, is not an essential property.

## 5.2. Candidate Rates

Based on these properties, the following O/N rates were considered:

- SARB Repo Rate
- Overnight FX Implied Rate
- South African Benchmark Overnight Rate (SABOR)
- South African Futures Exchange (SAFEX O/N)
- South African Benchmark Overnight Rate - Money Market (SABOR MM)
- South African Rand Interbank Offered Rate (ZARIBOR)
- South African Secured Financing Rate (SASFR)

[Appendix 4](#) provides the rationale behind including or excluding the rates above for further investigation. The two rates that met the criteria were:

5.2.1. An **Unsecured O/N rate** based on the criteria that was used for SABOR MM in the SARB’s consultation paper on selected interest rate benchmarks in South Africa. However, this rate will incorporate all O/N call deposits **across** financial institutions and non-bank financial institutions.

- The credit component of the counterparties to the transactions is limited because it’s an overnight transaction, hence the rate is “near-risk-free”
- This market has considerable volume and diversity of trading participants.

5.2.2. A **Secured O/N rate** implied by the current government bond repo market, like SASFR.

- This rate has been the focus of reference rate reform internationally and excludes the credit risk of the counterparties to the transaction.

- A well-functioning collateralized market insulates financial markets in times of stress and can serve as a critical determinant of efficacy of monetary policy transmission.

### **The SARB view on alternative risk-free rates for South Africa**

The choices proposed by the Risk-Free Reference Rates Work Stream as the candidates for overnight rates are similar to the ones the SARB initially proposed in the 2018 consultation paper. The SARB therefore supports these choices and has made further recommendations regarding the underlying interest to be measured by the unsecured and the secured overnight rates.

For the unsecured rate, the SARB is of the view that the rate should measure the interest at which rand-denominated overnight wholesale funds in South Africa are obtained by banks, where credit, liquidity and other risks are minimal. The reference to risk characteristics is in line with the work stream's recommendation that, among other things, the credit component of the counterparties to the transactions considered in the determination of the unsecured overnight rate is limited by virtue of the rate being based on overnight transactions. Hence, the rate is designated as 'near-risk-free'. Specifically, the SARB is aligned with the work stream's choice of the South African Rand Overnight Index Average (ZARONIA) as the candidate for the unsecured overnight rate. ZARONIA is a reformed version of the current South African Benchmark Overnight Rate (SABOR), and is the same as the SABOR Money Market (MM), which is a name previously used in the consultation paper.

For the secured rate, the SARB is of the view that the rate should measure the cost of raising secured overnight funding using eligible collateralised transactions, and as such, the SARB is aligned with the work stream's choice of the South African Secured Overnight Financing Rate (ZASFR) as the candidate for the secured rate.

## **6. Unsecured O/N Rate**

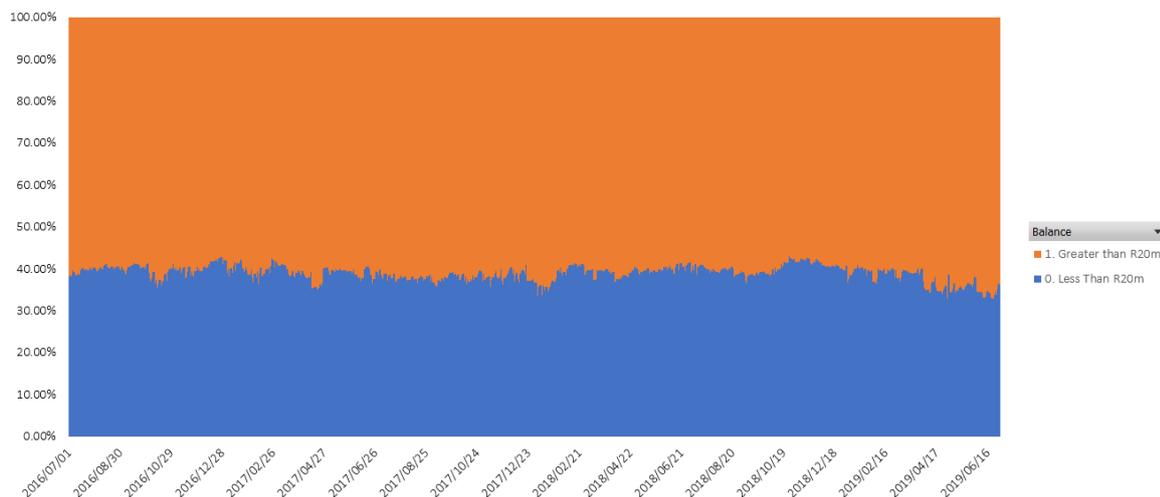
### **6.1. Methodology**

The methodology proposed to generate the Unsecured O/N reference rate is based on the wholesale unsecured borrowing costs of South African banks. The methodology aligns with rates produced globally as a result of the IBOR reform, i.e. €STR and TONA:

- Aggregate all O/N call deposits; use the rates of transactions settled on the same day as the trade date and maturing the following business day in the uncollateralized call money market. *There were no transactions that settled tomorrow next or spot next which matured on the following business day.*

- Classify the counterparties according to SARB classifications and then further aggregate these counterparties into:
  - Financial Corporates (including Banks and the interbank market)
  - Non-Financial Corporates
  - Public Sector Enterprises (PSEs)
- The data excludes any trades with local and international Central Bank counterparties as well as private trusts and other vehicles that service the household sector.
- Introduce a minimum balance that will reduce the data set but not skew the rate, balances less than R20 million were excluded from the calculation.
- Apply volume-weighted trimmed mean:
  - Ordering transactions from the lowest rate to the highest rate;
  - Aggregating the transactions occurring at each rate level;
  - Removing the top and bottom 25% in volume terms and
  - Calculating the mean of the remaining 50% of the volume-weighted distribution of rates

Graph 1 shows the total O/N call deposits split by balance over a period of last 36 months sourced from Bank 1. It must be noted that although Bank 1 is one of the largest banks in South Africa, its balance sheet composition varies from other banks in the market. This presents limitations to some of the inferences below which must be tested and verified by the other work streams, viz. the Data and Infrastructure work stream.



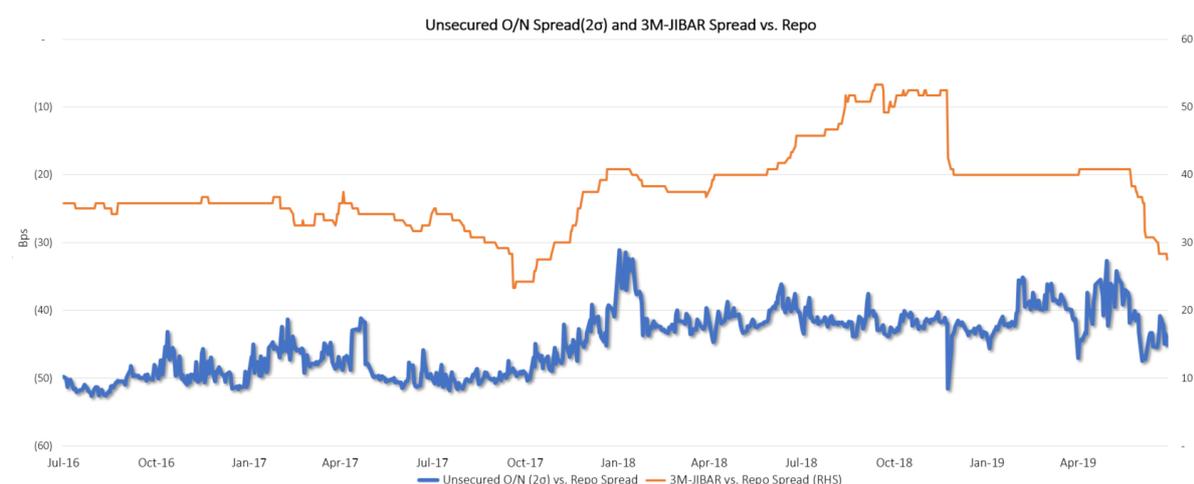
Graph 1: Total O/N call balances deposit balances for 36 months split by balance.

There is significant volume of balances lower than R20 million, however, this is split among a large set of small transactions with the median balance of less than R50 000.

This indicates that the impact on the result of including these transactions in the volume trimmed mean calculation, depending on the variance of the rate associated with the accounts, should be small. This ended up being the case, hence the balances < R20 million were excluded.

Graph 2 depicts the result of applying the volume-trimmed mean, as described above, to the remainder of the balances and its relative performance to 3M-JIBAR's spread over repo. The unsecured rate depicted in the graph is  $2\sigma$ 's away from the level. It must be noted that the Unsecured O/N rate is lower than the O/N SARB Repo rate which is secured.

	<b>Unsecured O/N vs. Repo</b>	<b>3M JIBAR vs. Repo</b>
<i>Mean Spread</i>	Between (30) bps and (55) bps	38 bps
<i>Standard Deviation</i>	15%	16%



Graph 2: The resulting Unsecured O/N Spread ( $2\sigma$  away from the mean) vs. 3M-JIBAR Spread vs. Repo

On average, Financial Corporates contributed between 20%-40% of the rate, Non-Financial Corporates 30%-50% of the rate and the Public Sector 15%-25% during the period of investigation. The rate generated compares well with the volatility of 3M-JIBAR given the importance of its adoption in derivative markets.

### **Key findings**

#### **Advantages of the unsecured ON rate:**

- *Has transactional volumes to meet IOSCO principles.*
- *More inclusive rate, for example, using non-bank counterparties O/N deposit accounts will mean that it is more reflective of money markets in South Africa.*

#### **Disadvantages of the unsecured ON rate:**

- *Rates across different counterparties will include regulatory pricing frictions and tactical differentials.*
- *Given these frictions, the rate will be less likely to capture monetary policy expectations.*
- *The rates will become unsuitable as reference rates during liquidity stresses as there is no viable fall-back and the rate is below the SARB Repo rate.*
- *Volatility in the rate will impact hedging and accounting practices, however it is as volatile as 3M-JIBAR.*
- *Data set required is significant and may rely on multiple processes within a contributing bank. System downtime for an institution who is a significant contributor of the rate will impact the outcome.*
- *The governance process around monitoring and managing the risks of publishing this rate daily will be complex.*
- *The investment by the market and regulator into infrastructure needed to monitor the credibility of this rate could be significant.*
- *There must be consistency amongst contributing banks when mapping counterparties.*
- *Applying the volume-weighted trimmed mean before the contributing bank sends the data set to the calculation agent vs. sending a complete data set to the calculation agent who applies the volume-weighted trimmed mean across all contributing banks will result in a different rate.*

### **The SARB view on the methodology for calculating an unsecured overnight interest rate**

The SARB's views on methodological issues that should apply to the determination of interest rate benchmarks, including the secured and unsecured overnight rates, are contained in the [Draft statement of methodology and the policies governing the SARB administered interest rate benchmarks](#), which was published on the MPG webpage in June 2020. The methodologies contained in the draft statement are consistent with the ones proposed in this paper by the Risk-Free Reference Rates Work Stream. The proposals remain as such until a data collection exercise, testing of the proposed methodologies and refinement thereof is completed.

It is instructive to note that the dataset used by the Risk-Free Reference Rate Work Stream to develop the statistical properties of the unsecured overnight rate in particular is very limited. The SARB, therefore, prefers not to draw or comment on any inferences drawn from such a limited dataset. From the SARB perspective, work is currently under way to enable a broader data collection exercise. This is an exercise that the SARB is undertaking together with the Data Collection and Infrastructure Work Stream as well as the Risk-Free Reference Rates Work Stream.

These views also apply to the observations made with regard to the secured overnight rate as discussed hereunder. The SARB acknowledges the amount of effort that is required to address the regulatory and structural constraints that exist in that market.

## 7. Secured O/N Rate

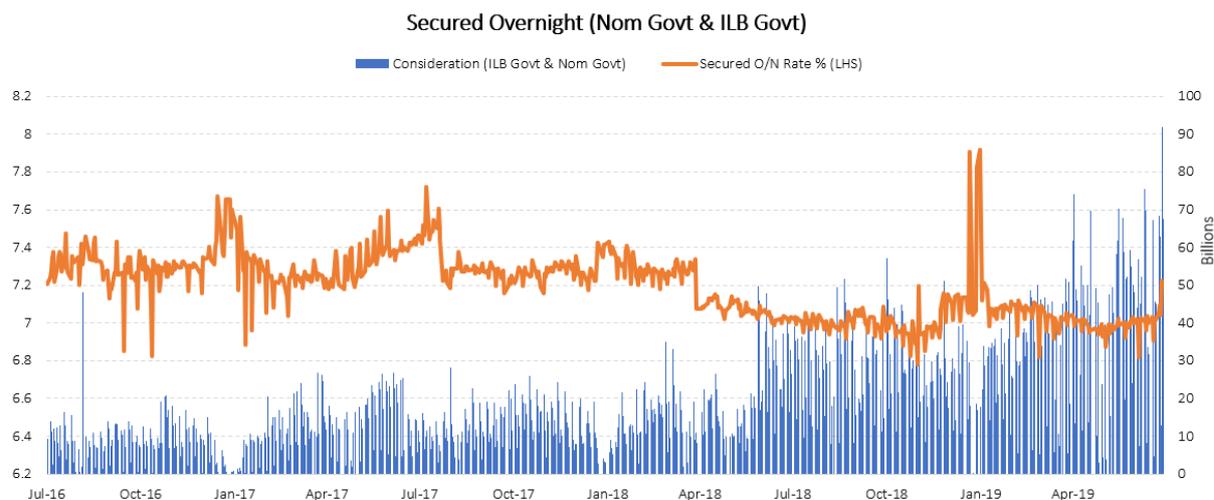
### 7.1. Methodology

The JSE has a central data store of all repo transactions (Buy/Sell Backs and Sell/Buy Backs) across the repo market captured on Nutron. The data provides the stock code, carry rate, consideration and term of the repo without revealing the counterparties involved in the deal. The data is rich enough to imply a daily Secured O/N rate based on O/N repo transactions that have underlying inflation and nominal government bonds. The rate produced in the example below is calculated using a volume-weighted mean rate using this repo transactions data.

Trade_Date	Instrument	Yield	Nominal	Consideration	Carry_Rate	Trade_Type	Buy_Party	Sell_Party	Settlement
2019/06/27	I2025	3.01	1,000,000.00	1,368,100.40	6.99	Repo 1	Local REPO	Local REPO	2019/07/01
2019/06/27	I2025	3.01183	1,000,000.00	1,368,362.40	6.99	Repo 2	Local REPO	Local REPO	2019/07/02

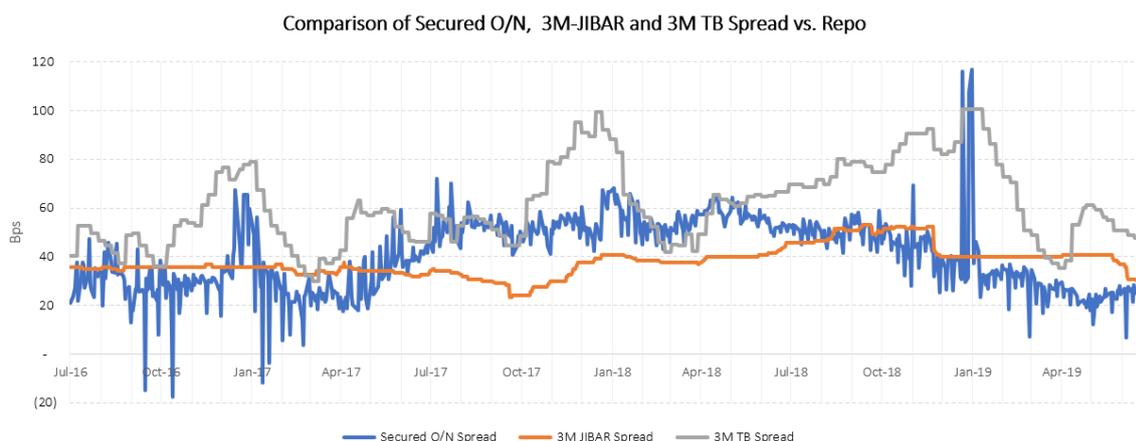
Example of a Repo trade captured by the JSE Trade Detail Market Data database

Graph 3 depicts the rate over the same 36-month period used to assess the Unsecured O/N rate above, as well as the daily volumes used to produce the rate.



Graph 3: Secured O/N rate implied by O/N GB Repo transactions across the market.

The comparison of the rate generated with 3M-JIBAR and 3M T-Bill shows that it is the most volatile of these three rates.



Graph 4: Comparison of the Secured O/N, 3M-JIBAR and 3M TB Spread over Repo.

	Daily Volumes (R'bn)	Secured O/N vs. Repo Spread (bps)	3M - JIBAR vs. Repo Spread (bps)	3M-TB vs. Repo Spread (bps)
<i>Mean</i>	19	41 bps	38 bps	61 bps
<i>Median</i>	15	42 bps	37 bps	58 bps
<i>Standard Deviation</i>	75%	36%	16%	27%
<i>Minimum</i>	0	(18) bps	23 bps	30 bps
<i>Maximum</i>	92	117 bps	53 bps	101 bps

The Secured O/N rate has a higher spread over repo than the 3M-JIBAR which is an unsecured rate and spikes during seasonal cash shortages amongst banks. These characteristics are a function of the structural inefficiencies found in the South African GB Repo market, viz:

- *The market is driven by participants who need to finance their long bond positions and hence it's highly correlated to their demand for cash, i.e. the rates traded converges to the level of cash borrowing rather than cash deposits.*
- *The banking sector is a significant funder of this market and the underlying demand for HQLA, the banks aggregated cost of funds and their supply of cash impacts the rate.*
- *Activity in repo market is not widely distributed and is dominated by few market participants.*

[Appendix 5](#) provides insights into the importance of repo markets in making collateral available to accommodate variation in supply and demand dynamics within a financial market. A well-functioning repo market insulates financial markets from idiosyncratic liquidity stresses and reduces the dependency on central banks to support markets. This appendix also addresses removing some of the structural inhibitors found in

South African markets that can aid in strengthening and transforming the SAGB Repo market.

### **Key findings**

#### **Advantages of the secured ON rate:**

- *Lowers systemic risk in the financial system.*
- *Enables markets to sustain themselves during a stress, i.e. less reliance on Central Bank support.*
- *Increases liquidity and optimises price discovery of collateral in secondary markets.*
- *Lowers borrowing costs.*
- *Increases price stability; differentiating between risk free and risky activities is easier, this will enable better hedging and risk management.*
- *During stresses, the Repo Rate can be used as the fall-back.*

#### **Disadvantages of secured ON rate:**

- *In its current form, the rate is more volatile than 3M-JIBAR and the Unsecured O/N rate.*
- *Increasing efficiency in Repo markets will increase leverage in the system if not managed and monitored by regulator.*
- *South African GC Repo markets needs regulatory and market infrastructure changes ([Appendix 5](#)).*

## **8. Key recommendations**

### ***Key Recommendation 1***

The Risk-Free Reference Rates Work Stream recommends two reference rates:

1. The Unsecured O/N rate based on unsecured O/N Call deposits from FI's (including the interbank market, excluding Central Banks), NBFIs and PSE's.
2. The Secured O/N rate based on the South African Government Bond Market repo market.

### **The SARB view on the choice of an alternative overnight reference rate**

The SARB supports the development of the secured and unsecured overnight benchmark rates, but is of the view that the adoption of these rates should be sequenced. Initial attention should be focused on the adoption of the benchmark that will be used as the reference rate to replace JIBAR.

Considering that there are currently substantial volumes in unsecured transactions, the SARB is of the view that South Africa should adopt the unsecured overnight rate as its preferred alternative reference rate to replace JIBAR. Specifically, the SARB supports the adoption of the South African Rand Overnight Index Average (ZARONIA) as the preferred candidate. ZARONIA is the measure of the interest rate at which rand-denominated overnight wholesale funds in South Africa are obtained by banks, where credit, liquidity and other risks are minimal.

The SARB's recommendation to adopt the unsecured overnight rate is not only underpinned by data sufficiency considerations, but also by operational challenges that South Africa will face in developing a secured overnight rate. These challenges include a combination of regulatory constraints that limit participation of certain market participants in the repo market, dominance of the repo market by few market makers as well as the need to expand the scope of collateral used in South Africa's repo market. Currently, the repo market is largely dominated by government bonds. Over and above these considerations, the SARB is also concerned that adopting both a secured and unsecured overnight rate could result in a situation where these rates are competing for the same pool of liquidity. This may hinder the adoption of the unsecured rate as the official overnight reference rate. Accordingly, focus must be on the adoption of the unsecured rate, and over time measures can be put in place to accelerate the enhancement of regulation and market infrastructure to develop a robust general collateral repo market.

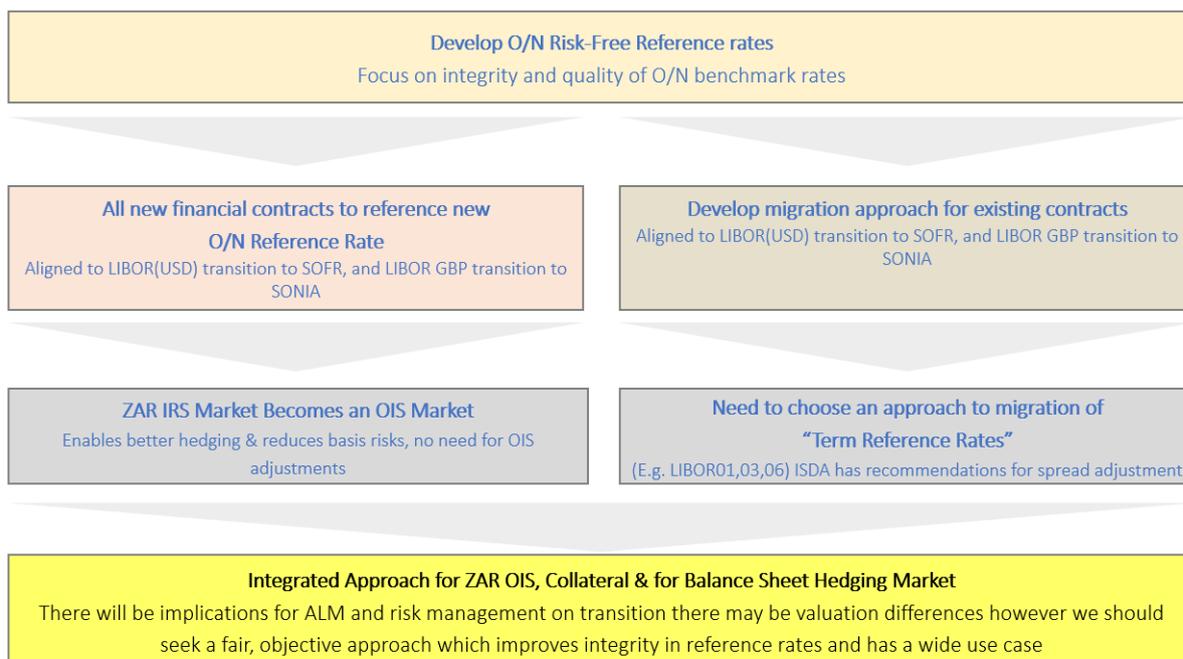
The recommendation to adopt an unsecured alternative reference rate is also in line with international consensus that a (near) risk-free rate is the appropriate reference for derivative transactions. This is due to the fact that market participants use derivatives to hedge an exposure or speculate on the general level of market-wide interest rates. Indeed, many jurisdictions (including major IBOR jurisdictions such as the United Kingdom and the Euro Area) have adopted near-risk free rates as their preferred alternatives. For South Africa, this move will mark a significant shift from the current practice, where derivative transactions reference term rates (i.e. three-month JIBAR), and will therefore require suitable transition arrangements (this is addressed later in the report). Furthermore, the decision for derivatives to reference near-risk-free rates does not preclude the adoption of a multiple reference rate approach, in which overnight (near) risk-free rates coexist with term rates.

### *Key recommendation 2*

When developing the O/N risk-free rates, the work across the Transition, Data Collection and Infrastructure, as well as the Governance work streams must closely follow the steps below that are consistent with the lessons learnt from international developments with SOFR, SONIA, €STR and TONA:

- i. Focus on the integrity and quality of the O/N Risk-free rates. For example, the unsecured rate is based on the data from just one bank, when investigating the proposed methodology these work streams must investigate:
  - Whether the minimum deposit amounts or impact of trimming creates unnecessary credit or concentration risk when producing the rate.
  - Aggregation across all contributing banks of one counterparty may result in a total balance of > R20 million, but on an individual basis results in exclusion of that depositor from the calculation.
  - Fallback triggers and the process to be followed thereafter.

- ii. Creating market infrastructure that allows for trading instruments (e.g. OIS) that will develop demand and liquidity of the O/N risk-free or near risk-free benchmark rate.
- iii. If JIBAR ceases to exist, the market, with support from the regulator, will have to encourage new financial contracts to reference the O/N risk-free rates and a migration plan is required for other existing instruments that reference JIBAR.
- iv. The transition of the ZAR interest rate swap market into an OIS market should follow a similar path experienced with the IBOR transition. A targeted cessation date will encourage market participants to move away from JIBAR-resetting instruments to instruments that use O/N rates. Hence, the use of OIS instruments for hedging and risk transfer will minimise basis risk and this will promote developing a term structure. A spread adjustment methodology may be required to deal with the migration of term reference rates.
- v. Follow the ISDA fallback methodology approach used for the IBOR transition.



## The SARB view on transition

South Africa's transition to alternative reference rates requires that certain steps be followed to transition in an orderly fashion. To this end, the SARB has proposed a roadmap for transition to the MPG. The approach contained in the roadmap entails the establishment of foundations for new markets in alternative reference rates as an initial step, followed by the adoption of the reference rates. Further, the roadmap proposes that transition only takes place once the alternative reference rate has been adopted. Where possible, this transition shall apply to legacy contracts as well. Alternatively,

there should be an agreement reached on contractual fallbacks, whose implementation shall mark the end of JIBAR as the key reference rate for South Africa.

The SARB is also of the view that South Africa can and will benefit from lessons learnt in other jurisdictions, where transition is already taking place. As an active member of the Official Sector Steering Group, the SARB is closely following developments in the major IBOR jurisdictions. The recommendations made by the Risk-Free Reference Rates Work Stream are aligned to the approach followed globally and the SARB supports them.

### **Key Recommendation 3**

Mandate the Data Work Stream to establish and implement data standards and conventions for the new rates.

- For the Unsecured O/N rate, standardized classifications are required for each counterparty which must be consistent across the entire banking sector to make sure that there is homogeneity over inclusion and exclusion criteria for a particular counterparty.
- For the Secured O/N rate, the data set off Nutron does not differentiate between Buy/Sell backs and Sell/Buy backs. This enhancement to the data is necessary.
- Methodology refinements may be required for both rates as a result of the work done in the data work stream.

### **The SARB view on data standards and conventions**

The SARB acknowledges that the quality and integrity of a benchmark is enhanced when the benchmark is anchored in an active market, in line with the International Organization of Securities Commissions (IOSCO) Principles for Financial Benchmarks. As such, the SARB agrees with the recommendation to establish and implement data standards and conventions for new interest rate benchmarks. The Data Collection and Infrastructure (DCI) work stream of the MPG is in the process of engaging multiple stakeholders to develop a comprehensive dataset, akin to a money market statistical report, which is expected to cover a broad range of interest rate benchmarks.

Although proposals for statements of methodology for the various overnight rates proposed by the SARB and the MPG work streams have already been published in the technical specification paper, each methodology is subject to refinement, depending on the outcomes of the public consultation as well as the outcomes of the testing that will be conducted by the SARB.

#### **Key recommendation 4**

Mandate the Governance Work Stream to establish and implement a Code of Conduct for these new reference rates.

- Standards for pre and post-trade transparency need to be determined in-line with IOSCO principles.
- Second- and third-line controls for the contributing banks, the calculation agent and the Prudential Authority will need to increase their sophistication to accurately monitor the data and processes to provide comfort to market participants on the credibility of the rate.

#### **The SARB view on governance**

Work pertaining to the governance of interest rate benchmarks is currently ongoing, led by the Governance Work Stream. This work stream, which is chaired by a senior official of the FSCA, has already made proposals in terms of the high-level design of the code of conduct for institutions that will contribute to financial benchmarks. In addition, the SARB has proposed a set of policies that will govern all interest rate benchmarks which fall under its jurisdiction as a designated benchmark administrator. In both instances, effort has been made to align the overarching principles of the aforementioned governance standards to the IOSCO Principles for Financial Benchmarks, the European Union Benchmark Regulation, as well as draft rules pertaining to standards for financial benchmarks in South Africa.

Generally, provisions contained in the code of conduct are not legally binding. The SARB strongly encourages that compliance with governance rules must be legally enforceable in order to enhance the integrity of the process. Accordingly, the provisions of the governance rules being developed must be based on the existing legal framework. For example, the governance rules for the new reference rates must be contained in a regulatory instrument made under the Financial Sector Regulations Act, 2017 (Act No.9 of 2017) and/or other relevant legislation.

#### **Key recommendation 5**

Measures need to be put in place to accelerate enhancing regulations and market infrastructure to develop a robust general collateral repo market in South Africa. These reforms will remove the structural biases and vulnerabilities of the current market which will enhance the integrity and quality of the Secured O/N reference rate.

### **The SARB view on developing a general collateral repo market**

The SARB agrees with and supports the recommendation that measures need to be put in place to accelerate the enhancement of the regulation that governs the operations of the repo market, as well as the improvement of market infrastructure to develop a robust general collateral (GC) repo market. As part of the development of the secured rate, the SARB recommends engaging with various stakeholders including the Risk-Free Reference Rates Work Stream, the FSCA, as well as the relevant financial market infrastructures to further this work. In addition, the SARB recommends that a working group be established to facilitate the work on developing the GC repo market.

## **9. Conclusion**

The methodologies and recommendations highlighted in this paper are intended to create reference rates that are reliable, unbiased, calculated in a transparent manner and easily accessible to the public. If adopted widely in the economy, a greater suite of robust O/N reference rates will aid more efficient monetary policy transmission and increase the ability of the SARB to monitor systemic risk and formulate an effective response to financial fragilities that may occur. However, there is a significant effort required to develop market conventions for these rates, infrastructure and policy that will aid creating a deep and liquid OIS market in South Africa and in the case of the Secured O/N rate further enhancements to the underlying markets that produce these rates.

## Appendix

### 1. Membership of the Risk-Free Reference Rates Work Stream

Members of the work stream were drawn from a diverse set of market practitioners whose expertise and insights were required to give effect to the work stream's mandate; viz:

- Senior representatives of the SARB;
- Senior representatives of the Financial Sector Conduct Authority (FSCA);
- Senior representatives of the major domestic banks;
- Senior representatives of the International Banking Association of SA;
- Senior representatives of the Association for Savings and Investment South Africa (ASISA);
- Senior representatives of the Association of Corporate Treasurers of Southern Africa (ACTSA);
- Senior representatives from the insurance industry;
- Senior members from hedge funds;
- Senior members from the exchanges;
- Senior members from the central security depositories;
- Representatives of National Treasury; and
- Any other representatives as deemed necessary by the MPG or the work stream.

### 2. Current overnight rates in South Africa relative to IOSCO Principles

#### 2.1 Desirable features of reference rates

The production of reference interest rates should achieve the following:

Theme	General feature	Definition	Importance
Integrity (Regulation and conduct)	Reliability	Proper governance and administration to safeguard against manipulation or error	Market integrity and functioning
	Robustness	Clear rules for reference rate production, including transparent and well-known fall-backs in periods of market stress	Availability and usability in times of market stress
	Representativeness	Rate drawn from a representative sample of transactions from the market in question	Correct pricing basis

Efficacy	<i>Frequency</i>	<i>Rates calculated daily to facilitate market functioning</i>	<i>Pricing of new contracts, mark-to-market valuation</i>
	<i>Availability</i>	<i>Published on dedicated sites</i>	<i>Verification of contracts</i>
	<i>Transmission</i>	<i>Market operations ensure functioning markets, liquidity and price transmission.</i>	<i>Monetary policy and financial stability objectives.</i>
Appropriateness	<i>Choice</i>	<i>Provide a suite of reference rates for different applications</i>	<i>Clear distinction between risk-free and risky secured/unsecured transactions</i>

*Source: BIS (2013) – Towards better reference rate practices: a central bank perspective*

This implies that reference rates should be produced based on a clear set of rules that includes transparent fall-back procedures for periods of market stress. There must be a sufficiently high frequency of publication to allow the pricing of contracts on an ongoing basis. The rate must be readily available to facilitate contract verification and be representative of a well-defined relevant market segment.

This view aligns with the SARB's approach of using the IOSCO principles for benchmark design, the most relevant principles applied are highlighted below:

#### Design

- A benchmark must be designed in such a way that it results in an accurate and reliable representation of the economic realities of the interest it seeks to measure.

#### Data sufficiency

- Data used to construct an interest rate benchmark must be sufficient to accurately and reliably represent the interest measured. Furthermore, the data should be based on prices or rates that have been formed by the competitive forces of demand and supply in an active market and should be anchored by observable transactions.

#### Hierarchy of data inputs

- Benchmark administrators must make guidelines available on the hierarchy of data inputs to be used when determining an interest rate benchmark.

#### Data waterfall

- This requires that benchmark determination is based on the following information content:
  - transaction data
  - live, tradable prices
  - expert judgment

## 2.2 Basic characteristics of overnight reference rates

The largest currency areas have all moved to O/N benchmarks based on the following key features:

- underpinned by a broad base and stable volume of transactions;
- good representation of a bank's O/N funding costs in money markets;
- representation of near risk-free bank borrowing costs;
- rate shows relative stability; and
- reduces opportunities for market manipulation.

The choice between secured and unsecured O/N rates have been made based on the liquidity and structural features of underlying money markets<sup>1</sup>. One advantage of U.K.'s SONIA is that it has been in existence since 1997 and the BOE took over its administration in April 2016, while the publication of reformed SONIA began in April 2018.

Using the guidance of the international approach, this work stream must note the following:

- Volumes aren't the only guiding principle as the transactions may not capture the correct economic rationale,
- The collateralized markets require enhancements to provide a robust alternative as a JIBAR replacement,
- When including different counterparties in the transactions set, their regulatory treatment must be considered as this may skew the rate applicable to such counterparties.

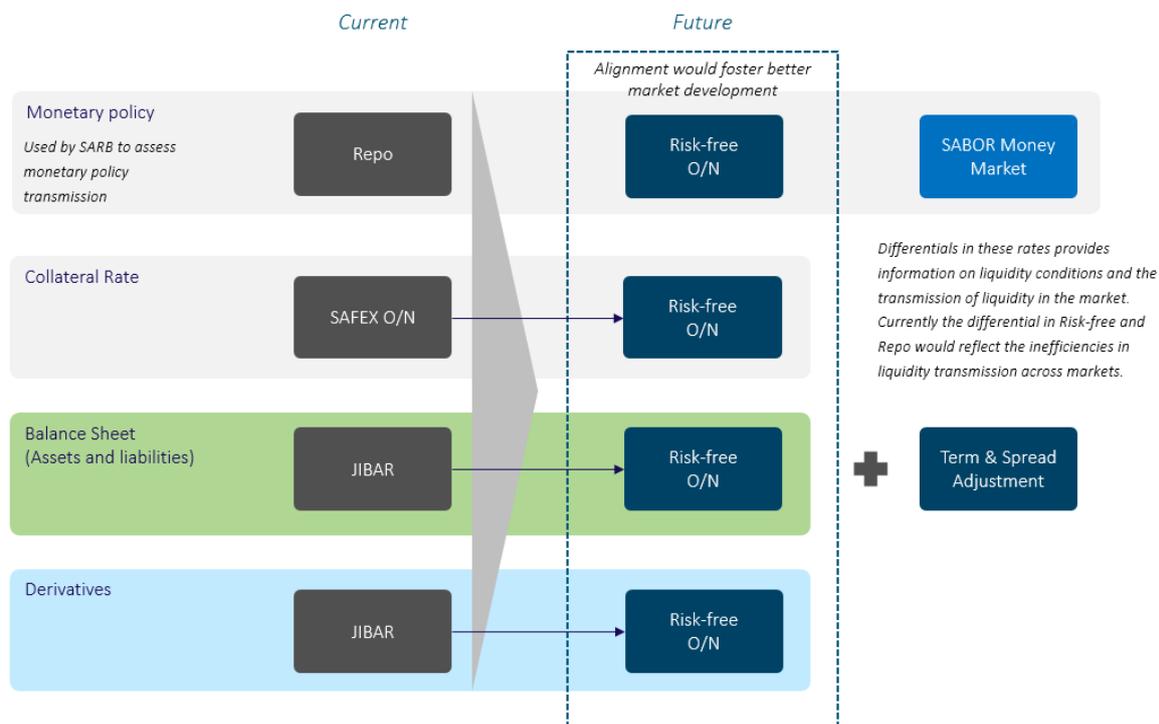
## 3. Linkages between policy rate and market rates are vital

Linkages between the policy rate and other market rates must exist as ignoring this will introduce basis risk with respect to the underlying interest used in hedge rates, collateral rates and derivative rates. The standard method of decomposing market interest rates is to separate them into risk-free rates and their relevant risk premia including liquidity, term and credit risk premia.

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<sup>1</sup> Transaction volumes may be necessary but aren't a sufficient condition. ARRC decided not to base the new RFR on Fed Funds or EURO DOLLAR markets as these markets have been dominated by arbitrage trades with little underlying economic rationale. In the EURO area, the secured benchmark would have been problematic because of high segmentation due to the differences in credit quality of the sovereign bonds serving as collateral.

An integrated approach will eliminate the basis risk across instrument types and activities and will allow the relevant risk premia to be associated with the appropriate risk types. The transition of cash instruments to RFR benchmarks should lead to greater liquidity in OIS markets as a reflection of hedging activity related to the various forms of investment and funding that have migrated to new RFR benchmarks.



## 4. Application of IOSCO Principles

### 4.1 Repo Rate

The repo rate administered by the SARB is the rate that it pays to banks to lend out central bank reserves in exchange for government securities on a weekly basis.

#### Summary:

- Rate administered by the SARB, hence immune to market manipulation.
- Secured rate with respect to transactions with the SARB, unsecured with respect to interbank transactions.
- Doesn't provide market participants any indication of future expectations of policy rate changes which are required to build a term structure.

#### Possible Applications:

- Fallback rate to O/N reference rate in times of stress.

#### Reference Rate Features:

- Integrity ✓
- Efficacy ✓

## 4.2 Overnight FX Implied Rate

Implied rate on one-day rand funding in the foreign exchange swap market.

### Summary:

- Secured rate.
- Not directly observable as it's implied from FX forward points.
- Regulatory restrictions to accessing market due to EXCON rules, results in pricing friction.
- Distribution of market participation is limited, although market is deep.
- Not a primary mechanism for raising bank funding.

### Possible Applications:

- Limited applications reference rate.

### Reference Rate Features:

- Integrity ✘
- Efficacy ✘
- Appropriateness ✘

## 4.3 SABOR

South African Benchmark Overnight Rate provides the market with a benchmark for rates paid on overnight interbank funding.

### Summary:

- Includes interbank funding at rates other than repo, Top 20 call depositors of banks and implied FX O/N.
- Combination of secured and unsecured components.
- Concentrated rate with respect to top depositors.
- Governance standards aren't as strict as JIBAR.
- SARB reference rate paper proposes reform.

### Possible Applications:

- Proposal to reform to SABOR Money Market.

### Reference Rate Features:

- Integrity ✘
- Efficacy ✘
- Appropriateness ✘

## 4.4 SABOR MM

Proposed replacement of current SABOR rate. More inclusive and competitive rate as it includes interbank trades done at repo as well as wholesale deposits provided by counterparties outside the Top 20 largest depositors.

**Summary:**

- Transaction data based.
- Volume weighted, T-1
- All unsecured deposits >R20m in size.
- Reflects eligible O/N unsecured funding from all banks (including funding obtained at the repo rate).
- Excludes the FX swaps.
- Introduce 1-day lag to accommodate actual transactional data.
- The market feedback on the SARB paper also requested the inclusion of call accounts to be investigated which will result in the rate being more reflective of money market activity within South Africa. However, NSFR and LCR impact on pricing must also be accounted for.
- Exhibits similar trend to current SABOR so market impact is minimal

**Possible Applications:**

- Risk inclusive reference rate an alternative to JIBAR.
- Possible underlying interest for OIS market.
- The construction means it is IOSCO compliant.

**Reference Rate Features:**

- Integrity ✓
- Efficacy ✓
- Appropriateness ✓

## 4.5 SAFEX O/N

Interest paid to clients with initial margin on deposit at SAFEX. The rate is based on the Rand Overnight Deposit Rate Index (RODI) less 25 basis points. The RODI is a weighted average of the overnight call deposit rates paid by local and foreign financial institutions where SAFEX places its daily margin deposits received by members.

**Summary:**

- Rate is currently not based on transaction volumes.
- Even if it was volumes based, the volumes are dependent on financial market volatility.
- Excludes many non-bank non-financial counterparties.

**Possible Applications:**

- Current format of rate doesn't meet criteria for consideration as a reference rate.

**Reference Rate Features:**

- Integrity ✗
- Efficacy ✗
- Appropriateness ✗

## 4.6 ZARIBOR

A new rate to be used as a rate being an interbank interest rate benchmark, limiting the scope for ZARibor to interbank deposits only is further informed by the fact that the rate could be considered for use in the SARB's financial stability monitoring framework to determine the network structure of the domestic interbank market.

**Summary:**

- Volume weighted average of eligible O/N interbank transactions from all banks (at repo and non-repo rates).
- Considered as near risk free benchmark as it includes minimal credit and liquidity risks, hence near zero probability of financial loss.
- SARB reference rate paper indicates that the rate is at least 10bps below repo rate and 7 bps below current SABOR emphasising its potential as a near risk free equivalent.
- Similar volatility to current SABOR.

**Possible Applications:**

- Positive feedback from market participants on use as a possible risk-free reference rate, however transactions that the rate is based on excludes all non-bank market participants
- The repo-rate can be used as a fall-back rate in times of excessive volatility.

**Reference Rate Features:**

- Integrity ✓
- Efficacy ✓

**4.7 SASFR**

Newly proposed rate that represents the cost of raising secured funding in the domestic market.

**Summary:**

- Proposal from SARB indicates that the rate will include transactions from O/N GB repo and the supplementary repo conducted with SARB.
- Feedback from market participants indicates hesitancy to adopt this rate because of the market reform that is required to increase collateral mobility which will create an efficient secured market.

**Possible Applications:**

In theory, should the market reforms required be accelerated and adopted, the production of this rate could have the following applications:

- Derivative and secured financing rate.
- Considered as a reference rate for the OIS market.
- This rate could be a critical determinant of efficacy of liquidity and monetary policy transmission.
- To the extent the rate deviates from target monetary policy rates (as is currently the case) reveals inefficiencies in liquidity and or collateral transmission.
- It is this rate that has been the focus of reference rate reform internationally.
- Forms the base to transition from JIBAR to RFRs.
- Will suffer from the volatility experienced during cash shortages in the local market (e.g. seasonally during December).

**Reference Rate Features:**

- Integrity ✓
- Efficacy ✓
- Appropriateness ✓

## 5. Importance of collateral in financial markets

Repo markets facilitate the flow of cash and securities around the financial system. They create and support opportunities for the low-risk investment of cash, as well as the efficient management of liquidity and collateral by financial and non-financial firms. A well-functioning repo market supports liquidity and price discovery in the cash market, thus helping to improve the cost of funding for firms and governments. This is proven to reduce vulnerabilities of markets during a stress if the appropriate collateral is made available through the correct channels.

The International Capital Market Association (ICMA) describes collateral as the new cash. Market reforms, such as Basel III liquidity requirements and margin requirements for OTC derivatives, means that banks, investors and market users need to become adept at managing their liquidity, collateral and risk. Collateral optimisation will mean that assets are better sourced, priced and allocated within the system. ICMA defines collateral fluidity as the forces that allow collateral to move around the system to meet varying demand and supply dynamics across financial markets. Their research found that *inhibiting collateral fluidity* has the following impact:

In markets:

- Lower liquidity in secondary markets for securities,
- Higher asset price volatility,
- Difficulty hedging and the pricing and management of risk,
- Higher execution risks for investors.

In the economy:

- Higher borrowing costs for governments,
- Increased costs for corporate capital raisers,
- Increased cliff-effect risks for pension and other institutional investment funds,
- More responsibility on central banks to support the markets,
- Dampening effects on GDP and economic growth,
- Increased systemic risks to the financial system that will be crystallized under conditions of market stress.

The importance of removing inhibitors to the formation of a GC Repo market within South Africa is essential to develop that secured reference rates. The feedback on the SARB reference rates paper highlights some of these inhibitors, viz;

- In response to using SASFR as a reference rate, market participants are hesitant as the underlying buy-sell-back market in South Africa suffers from structural inefficiencies such as:
- *Activity in repo market is not widely distributed and is dominated by few market participants. This market is primarily funded by a few of the larger banks who utilise this activity to access High-Quality Liquid Assets (HQLA) to comply with the Basel III liquidity regulations. This implies that the rates in this market are dependent on the*

*funding banks' liquidity profile, i.e. cash shortages amongst these banks result in elevated rates in the repo market.*

- *The market is also driven by participants who need to finance their long bond positions and hence it's highly correlated to their demand for cash, i.e. the rates traded converges to the level of cash borrowing rather than cash deposits.*
- *Transactions are concentrated in the O/N and 1W maturities.*
  
- *In response to creating a General Collateral (GC) Repo market, the feedback by market participants noted the following:*
  - *The amendment of Board Notice 90 which will permit money market funds to transact in reverse repos. Currently, a GC Repo is reflected as transferring outright ownership transfer of assets which is in breach of fund mandates. Amending BN90 will reduce the concentration of cash providers, i.e. banks, in this market and allow for better price discovery.*
  - *Amending clause 25 of the Financial Markets Act 19 of 2012. This clause refers to reporting of transactions in listed securities which requires securities to be booked through the JSE's Nutron system. Nutron can only cater for buy-sell-backs and does not have the ability to book GC Repos with haircuts and provide daily MTM margining.*
  - *The Prudential Authority should consider broadening the collateral pool for its market operations which will mobilise other pools of collateral within the financial system.<sup>2</sup>*

National Treasury has established a "Prudential Committee<sup>3</sup>" to assist in addressing items in regulations that will make South African markets more efficient and resilient. Further to the reasons listed above this committee has also voiced its concern around other impediments that impact the creation of efficient and effective collateralised markets, these are identified below.

i. Insurance Companies:

- Reverse repos are a key for enhancing ALM structures to generate yield when investing in assets used to manage insurance liabilities.
- Buy-sell-backs are automatically permitted by the FSCA.
- GC repos are prohibited as they are viewed as asset encumbrance and require approval by the FSCA.

ii. OTC Margin Regulations:

- Only certain non-cash collateral can be pledged as IM.
- Non-bank FI's do not hold large amounts of HQLA for collateral.

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<sup>2</sup> Central bank operating frameworks and collateral markets release by BIS in 2015 details the role Central Banks play in creating liquidity in markets. The paper describes the influence of central banks on instruments used in their market operations in 2 forms; (1) a structural impact with respect to demand and supply, and (2) a scarcity impact with respect to price and quality.

<sup>3</sup> This committee consists of banks (BASA), the savings industry (ASISA), prudential regulators then (FSB & SARB), and policy makers (NT). The committee was established to (1) address and expedite matters that may affect the financial sector (2) understand the unintended impacts of certain regulations on all sectors in financial markets, (3) address co-ordination failures across the sector which leads to sub-optimal outcomes for the system.

- Cash collateral causes a drag on investment performance as it only earns SABOR.
  - Placing this cash with banks adds to the concentration risk limits placed with major banks, e.g. SAM regulations stipulates a 20% exposure to major banks including margin and call accounts.
  - Insurers can't encumber assets as margin without explicit FSCA approval.
- iii. Structural inhibitors with Buy-Sell-Backs:
- Buy-sell-backs are security specific which reduces its ability to allow for liquidity transmission in the system.
  - There are differing tax treatments of Buy-Sell-Backs, GC Repos and other secured financing transactions. These different tax treatments also apply to equity vs. bond collateral.
  - Collateral is not legally ringfenced which means that there is higher credit risk on default.
- iv. Market Infrastructure:
- There is a significant amount of liquid assets for LAR that are held in the SARB CSD.
  - This creates a bottle neck for high frequency collateral substitution, e.g. a portion of these assets could be used as security in the secured interbank market.

**NB:** Given the above points, measures need to be put in place to accelerate enhancing regulations and market infrastructure to develop a robust GC Repo market in South

- Amendment of BN90 to allow for reverse repos by money market funds.
- The JSE must improve the Nutron system to allow for GC Repos with haircuts and different collateral types including baskets.
- The Prudential Authority must provide insight into allowing access to central bank reserves via an expanded collateral set.
- Align regulatory, legal and tax treatments related to pledge, and outright transfer of collateral, as well as treatment of trades under repo vs BSB, and equity versus bond collateral.
- SARB must become integrated into the Tri-Party Collateral Service Providers which will enable:
  - Automated substitutions that are rule-based.
  - Automated custody inventory that links SARB collateral to the collateral needs of banks.
  - Smoother market settlement of all secured financing transactions.

The banking system in South Africa requires a more robust solution for secured markets to facilitate the following:

- Secured interbank transactions amongst ZAR clearing banks. This will lower the risk in the system during an idiosyncratic liquidity stress.
- A replacement for the Committed Liquidity Facility (c. R140bn) that banks currently have in their high-quality liquid assets to comply with Basel III regulations which will fall away in December 2021. These assets consist of a securitised form of mortgage and vehicle loans from the bank. The solution proposed amongst the banks was a collateral exchange mechanism of these CLF assets via CCP which will provide a collateral upgrade to a bank during periods of low LCR for the banks<sup>4</sup>.

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<sup>4</sup> Documentation of this proposal is available on request.

## References

- ARRC. (2019, April). *User Guide to SOFR*. Retrieved from New York Fed: [https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2019/Users\\_Guide\\_to\\_SOFR.pdf](https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2019/Users_Guide_to_SOFR.pdf)
- BIS. (2015, March). *Central bank operating frameworks and collateral markets*. Retrieved from BIS: <https://www.bis.org/publ/cgfs53.pdf>
- BIS. (2017, April). *Repo market functioning*. Retrieved from BIS: <https://www.bis.org/publ/cgfs59.pdf>
- BIS. (2019, March). *Beyond LIBOR: a primer on the new reference rates*. Retrieved from BIS: [https://www.bis.org/publ/qtrpdf/r\\_qt1903e.pdf](https://www.bis.org/publ/qtrpdf/r_qt1903e.pdf)
- FSB. (2019, December). *FSB Publications*. Retrieved from Reforming major interest rate benchmarks: Progress Report: <https://www.fsb.org/wp-content/uploads/P181219.pdf>
- Group, J. Y.-F. (2016, March). *Bank of Japan*. Retrieved from Bank of Japan: <https://www.boj.or.jp/en/paym/market/sg/rfr1603c.pdf>
- ICMA. (2014, September). *Collateral Fluidity*. Retrieved from ICMA: <https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/repo-and-collateral-markets/icma-ercc-publications/icma-ercc-reports/collateral-fluidity/>
- IOSCO. (2013, July). *Principles for Financial Benchmarks*. Retrieved from IOSCO: <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf>
- IOSCO. (2019, July). *IOSCO*. Retrieved from Statement Regarding Benchmark Transition: <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD636.pdf>
- ISDA. (2019, September). Retrieved from ISDA Final Parameters Consultation Report: <https://www.isda.org/a/935TE/2019.11.15-ISDA-Final-Parameters-Consultation-Report.pdf>
- SARB. (2018, August). *South African Reserve Bank*. Retrieved from <https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/8722/Consultation%20Paper%2028-08-2018.pdf>
- Stein, D. D. (2015). *AWAWEB*. Retrieved from Reforming LIBOR and Other Financial: <https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.29.2.191>